SAMUEL PIERPONT LANGLEY (1834–1906)

Fellow in Class I, Section 2, 1883.

What can a writer of a notice of Samuel Pierpont Langley, twelve years after his death, add to the notices already published in the leading scientific societies of the world: especially the full notices at the memorial meeting in the Smithsonian Institution, Dec. 3, 1906? The American Academy of Arts and Sciences, however, would feel that it would be lacking in respect to the memory of one of its most distinguished members if it did not commemorate, even in a brief note, his achievements. The American Academy early recognized his ability by the bestowal of the Rumford medals; and it can now point with pride to the justification of their confidence in the value of his work.

Samuel Pierpont Langley was born in Roxbury, Mass., Aug. 22, 1834. He was educated in the Boston Latin School and in the Boston High School. Having adopted the profession of an architect and a civil engineer, he went to the West and engaged for a time in practical life; but his scientific tastes prevailed and he came back to the east to take up the study of astronomy. He became an assistant in the Harvard College Observatory, and at the age of thirty-two was appointed Director of the Allegheny Observatory, where he remained for twenty years.

He became a pioneer in the new subject of astrophysics and soon began a series of investigations on radiant energy, especially manifested in the solar spectrum. In his early experiments he used the apparatus made classical by previous investigators — the combination of junctions of bismuth and antimony, called the Melloni pile. These junctions are very sensitive to radiant heat, and the thermo-electric currents developed at the junctions can be measured by a suitable instrument — a galvanometer — placed in an electric circuit — namely the circuit of the junctions and the galvanometer. Langley found, as so many did, that thermo-electricity cannot be depended upon for accuracy of indications of small amounts of heat. He therefore adopted the electric balance, in which the increase of electrical resistance in a coil submitted to heat, is balanced by other coils. The electrical balance is what is known as the Wheatstone's Bridge. Langley's contribution to the electrical balance was the use of an

excessively fine metallic filament for the resistance submitted to radiant energy. This filament responded to extraordinarily small increments of heat. I well remember his enthusiasm, when on a visit to Cambridge, he showed me the modification of the balance which he called a bolometer and said "I have found a means of overcoming all my difficulties." A new instrument often marks the beginning of a new epoch in science, Langley opened a great field of investigation in that portion of the solar spectrum which extends into darkness beyond the visible red — the portion called the infra red; and mapped lines and absorption bands in a region eight to ten times the extent of the visible spectrum.

With his bolometer he undertook an investigation of the heat of the moon; but could not distinguish between the heat given off by the body of the moon and that due to reflection of the sun's rays. He made journeys to Mt. Whitney where the height and steadiness of the atmosphere promised to enable him to determine the constancy of the radiation of the sun. He laid the foundation of the subsequent refined measurements of Dr. Abbot. When Langley was called to the Smithsonian, as Director he founded an astrophysical observatory in connection with the Institution which has become renowned as a centre of investigation of radiant energy.

Langley obtained by his investigations with the bolometer an enduring place in the history of science which, however, was to be greatly increased by his later work on the aeroplane. My acquaintance with him began on a camping out expedition in Maine. He impressed me as a man wrapped in heavy thought. One evening Professor Alfred M. Mayer, who was of the party, expressed the conviction that a scientific man could acquire in half an hour the practical experience which had taken our guide twenty years to obtain; and he and Langley took lessons in paddling a canoe. There was no wind and the lake, on the shores of which we were encamped was placid. Langley, taking with him a copy of Maxwell's Matter and Motion, paddled across the lake. A thunder cloud presently arose and Langley endeavored to return; but there was no stone in the bow of the canoe; and it did not occur to him to shift his position to the middle of the canoe. He had to summon the guide. Later we were together in London, and on one occasion while riding in the suburbs, he broke a moody silence by remarking, "How absurd it is to be carried by this horse — a mass of flesh and bones, nine hundred pounds in weight, I have an engine, which weighs only four pounds and develops two horse power."

When the idea of flying possessed him he went ahead without regard to the universal ridicule which greeted those who believed that flying was possible — a ridicule fully expressed by the poem, "Darius Green and his flying machine," and was constantly showing his friends little devices, modifications of boomerangs, arrangements of wings and screws which showed marvellous capabilities of flight. Finally in 1896 he constructed a machine which was driven by a small steam engine and which flew down the Potomac a distance of over a mile. The machine was set off on a car which ran forward on ways, and which fell down at the extremity of the car's motion, releasing the aeroplane for its flight.

In 1898 a board consisting of army and navy officers was appointed to investigate Langley's experiments. Their report was favorable and the board allotted $50,000 for the development and construction of a large aeroplane. A difficulty was met in obtaining a suitable light engine and suitable materials for the guys and wings. In 1901 a gasoline engine was secured and work proceeded. The first machine weighed 830 pounds and had a surface of 1,040 square feet. The entire power plant weighed less than 5 pounds to the horse power. The successful small mechanical model which made the flight of a mile, weighed 58 pounds, had a surface of 66 square feet and an engine which developed $2\frac{1}{2}$ to 3 horse power. The same launching apparatus which had worked successfully in the case of the small model was prepared for the large machine. The weather conditions on the Potomac were most baffling. It seemed as if the winds followed the course of the river and Langley, with hope deferred must have suffered great perturbation of spirit in studying the weather conditions. There seemed to be a malevolence in nature; which we feel in war times. A small house had been erected on the banks of the Potomac and the launching ways carefully tested. On October 7, 1903, in the presence of a curious throng of spectators the conditions of the atmosphere seemed propitious. The engineer took his seat and the car with the aeroplane sped down the ways. Just as it left the track, with the 50 horse power engine whirling the propellor, one of the guys was caught by the falling ways, a front guy post was also caught. The front of the machine was dragged downwards and the machine plunged into the water about 50 yards in front of the boathouse.

After some repairs a second attempt was made on December 8, 1903, with a resulting disaster. The rear guy post seemed to drag, bringing the rudder down on the launching ways with a crashing rending sound and a collapse of the rear wings. The machine was

wrecked and the funds, exhausted. Langley said, "Failure in the aerodrome itself, in its engines there had been none: and it is believed that it is at the moment of success, and when the engineering problems have been solved, a lack of means has prevented a continuance of the work." If he had only thought of mounting his aeroplane on bicycle wheels! what a small thing prevented his success. One recalls the canoe episode on the Maine lake. I know of no more touching episode in the history of invention. He had success in his grasp. A critic has said that he ought to have stopped with his mechanical model; for he had not the engineering skill to perfect his invention. It seems to me that this is not true. Langley combined with his theoretical knowledge of mechanics a remarkable practical skill. His aeroplane afterwards flew. Perhaps he underated the necessity of practical experience in balancing even after a successful launching. With what exultation of spirit he would survey today the progress of aviation. It is one of the unintelligible things in this life that this exultation was denied him; for he was a man especially fond of distinction. He failed for the want of a few thousand dollars; and the United States Government is now appropriating millions for aeroplanes. In the Smithsonian Miscellaneous Collections for 1907, will be found a complete bibliography of Langley's papers. It contains 284 references.

JOHN TROWBRIDGE.

THOMAS RAYNESFORD LOUNSBURY (1838–1915)

Fellow in Class III, Section 2, 1896.

I

Thomas Raynesford Lounsbury, son of Thomas and Mary Janette (Woodward) Lounsbury, was born on January 1st, 1838, at Ovid, New York, where his father was pastor of the Presbyterian Church. At the age of seventeen he entered Yale College; he took his degree in 1859. His undergraduate career was distinguished by sundry prizes and other such recognitions of literary propensities. After graduation he was for some time employed on the not too mature staff engaged in preparing Appleton's New American Cyclopaedia. From 1862 to 1865 he served as an infantry officer in the Civil War,